SUCTION HEAD OF VACUUM CLEANER WITH POWER BRUSH

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a suction head of a vacuum cleaner and particularly, to a suction head of a vacuum cleaner with a power brush rotary abutted on the cleaning object to separate a foreign material from the cleaning object and suck the foreign material.

2. Description of the Background Art

Generally, a vacuum cleaner is a cleaning instrument for collecting and cleaning foreign materials such as dusts and the like existing on cleaning objects by a strong suction force generated by operation of a fan motor assembly.

Among the vacuum cleaners, a vacuum cleaner having a power brush which is also called as an agitator in the suction head, for removing foreign materials from the cleaning object more easily by separating foreign materials being rotary abutted on the cleaning object, thus to improve cleaning performance is known.

As shown in Figure 1, the vacuum cleaner having the power brush includes a cleaner body 1 having a fan motor assembly for generating a suction force to suck foreign materials such as dusts and the like existing on the cleaning object, a connecting tube 5 which is a passage lengthened-connected to the

cleaner body 1, for sucking the foreign materials and a suction head 10 connected to the end of the connecting tube 5 for sucking foreign materials under the condition that it is abutted to the cleaning object in the vicinity to the cleaning object.

Particularly, in the suction head 10, a power brush 20 for separating foreign materials existing on the cleaning object is installed.

The structure of the suction head having the power brush will be described with reference to Figure 2.

The suction head 10 includes a head case 11 connected to the connecting tube 5 shown in Figure 1 and having a suction hole for sucking foreign materials on the lower surface at the same time, a power brush 20 having a part protruded to outside through the suction hole 15 in the head case 11, being rotary abutted to the cleaning object, a rotation shaft 25 installed rotatably in the head case 11, for supporting the power brush 20 and an electric motor 30 fixed in the head case 11, for rotary operating the power brush 20 by rotating the rotation shaft 25.

Here, the power brush 20 has a cylindrical shape and the rotation shaft 30 is fixed to the center portion of the both sides. On the outer circumferential surface of the power brush 20, a brush 22 positioned in the spiral direction to the direction of the rotation shaft 25 to be abutted to the surface of the cleaning object is installed.

The electric motor 30 is fixed in parallel to the power brush 20 and the rotation force 25 in the head case 11 and respective pulleys 33 and 34 are positioned on the shaft 31 of the electric motor 30 and the rotation shaft 25. The pulleys are connected to the belt 35 mutually and accordingly, the driving force generated in the electric motor 30 can be transmitted to the power brush 20.

In the vacuum cleaner having the conventional power brush with above described structure, when the pan motor assembly in the cleaner body 1 is operated a suction force is generated in the head case 11 of the suction head 10 and at this time, foreign materials such as dusts and the like existing on the cleaning object are sucked through the suction hole 15 of the head case 11.

When a power is supplied to the electric motor 30 in the suction head 10, the power brush 20 rotates and separates foreign materials as it is rotary abutted to the surface of the cleaning object. The separated foreign materials are sucked through the suction hole 15 by the suction force generated in the cleaner body 1.

The suction head of the vacuum cleaner having the conventional power brush has a problem that the size of the suction head 10 becomes relatively larger since the electric motor 30 is installed outside the power brush 20 to rotate the power brush 20 and additional space for installing the electric motor 30 in the suction head 10.

Also, the suction head of the vacuum cleaner having the conventional power brush also has a problem that the belt 35 can be loosened in case of using the cleaner for a long period since the suction head is formed to transmit the driving force of the electric motor 30 to the power brush 20 by the belt 35 and rotary operation of the power brush 20 is not smoothly progressed, thus to lowering cleaning efficiency.

Particularly, the suction head of the vacuum cleaner having the conventional power brush also has a problem that the foreign materials on the cleaning object are not easily removed since the power brush is formed to separate the foreign materials, being abutted to the cleaning object only in the direction that the power brush rotates, thus to have a limit in improving cleaning

performance of the cleaner.

SUMMARY OF THE INVENTION

Therefore, the present invention is to solve the problem of the conventional art and provides a suction head of a vacuum cleaner with a power brush capable of performing more compact design reducing the size of the suction head by installing a motor and the like which provides a driving force to the power brush in the power brush.

Also, another object the present invention is to provide a suction head of a vacuum cleaner with a power brush capable of improving performance of separating foreign materials from a cleaning object by forming a structure where the power brush can perform rotary and linear movement at the same time, thus to improve cleaning performance.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided a suction head of a vacuum cleaner with a power brush, including a head case connected with a cleaner body by a connecting tube having a suction hole on a lower surface, a power brush positioned in the head case and protruded toward the outside of the head case through the suction hole thus to be abutted to a cleaning object, a supporting means fixed in the head case, for supporting the power brush to be capable of performing rotary and linear movements, a rotary operating means installed between the supporting means and power brush in the power brush, for rotary operating the power brush and a linear operating means installed between the supporting means and power brush

in the power brush, for moving the power brush linearly.

The power brush is formed in the cylindrical shape and a brush is abutted to the cleaning object on the outer circumferential surface and the brush is arranged in a spiral shape on the circumferential surface of the power brush.

The supporting means includes a supporting shaft having both ends fixed on the inner wall of the head case under the condition that the supporting means protrudes the power brush, a linear moving guide means positioned between the supporting shaft and the power brush, for guiding the power brush to move linearly along the supporting shaft and a bearing installed between the linear moving guiding means and the power brush, for rotating the power brush.

The linear moving guide means is a guide bush fixed with the supporting shaft due to having a cylindrical shape and combined with an inner race of the bearing in the serration structure to mutually lock each other in the rotary direction.

The guide bush has a stopper for restrict linear movement of the power brush at the both end portions and the guide bush has a hole where an electric cable passes so that a power source can be supplied to the rotary operating means and the linear operating means.

The rotary operating means is a rotary type motor comprising a stator fixed to the supporting means and a rotor fixed on the inner circumferential surface of the power brush.

The linear operating means includes a solenoid coil fixed to the supporting means, for generating flux, a moving core fixed to the inner circumferential surface of the power brush, for generating a linear moving force by the flux generated by the solenoid coil and an elastic means supported in the head case, for generating an opposed force to a force generated between the solenoid coil and the moving

core.

The elastic means is installed between the both side surfaces of the power brush and the both inner wall surfaces of the head case respectively and provides an elastic force so that the power brush performs linear fluctuating movement in the longitudinal direction.

Also, the suction head of a vacuum cleaner with a power brush includes a head case connected with a cleaner body by a connecting tube having a suction hole on a lower surface, a power brush positioned in the head case and protruded toward the outside of the head case through the suction hole thus to be abutted to a cleaning object, a supporting means fixed in the head case, for supporting the power brush to be capable of performing a rotary movement and a rotary operating means installed between the supporting means and power brush in the power brush, for rotary operating the power brush.

Also, the suction head of a vacuum cleaner with a power brush includes a head case connected with a cleaner body by a connecting tube having a suction hole on a lower surface, a power brush positioned in the head case and protruded toward the outside of the head case through the suction hole thus to be abutted to a cleaning object, a supporting means fixed in the head case, for supporting the power brush to be capable of performing linear movements and a linear operating means installed between the supporting means and power brush in the power brush, for moving the power brush linearly.

As described above, the present invention has advantages that the size of the suction head can be reduced and cleaning performance can be improved by improving foreign material separating function from the cleaning object.

The foregoing and other, features, aspects and advantages of the present

invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Figure 1 is showing a conventional vacuum cleaner;

Figure 2 is a cross-sectional view taken along section line A-A of Figure 1 and a horizontal sectional view showing a suction head of a vacuum cleaner with a conventional power brush;

Figure 3 is a side view showing a vacuum cleaner in accordance with the present invention;

Figure 4 is a cross-sectional view taken along section line B-B of Figure 3 and a horizontal sectional view showing a suction head of a vacuum cleaner with a power brush in accordance with the present invention;

Figure 5A is a detail view showing "C" portion of Figure 4; and

Figure 5B is a cross-sectional view taken along section line D-D of Figure 5A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

The number of embodiment of a suction head of a vacuum cleaner with a power brush in accordance with the present invention can be plural and hereinafter, most desirable embodiment will be described.

Figure 3 is a side view showing a vacuum cleaner in accordance with the present invention and Figure 4 is a cross-sectional view taken along section line B-B of Figure 3 and a horizontal sectional view showing a suction head of a vacuum cleaner with a power brush in accordance with the present invention.

With reference to Figure 3, the vacuum cleaner includes a cleaner body 50 having a fan motor assembly for generating suction force and a collecting room for collecting foreign material, a collecting tube 55 lengthened from the cleaner body 50, which is a passage where foreign materials are sucked and a suction head 60 positioned near from the cleaning object at the end of the connecting tube, for sucking foreign materials such as dusts and the like.

Here, in the suction head 60, a power brush 70 is installed for separating the foreign materials from the cleaning object, being rotary abutted to the cleaning object.

With reference to Figure 4, the suction head 60 includes a head case 61 connected with the cleaner body 50 through the connecting tube 55, a supporting shaft 65 lengthened-installed in the longitudinal direction of the head case in the head case 61, the power brush 70 combined with the supporting shaft to be moved in the rectillineal direction of the rotation direction to the supporting shaft 65, a rotary operating device 80 installed in the power brush 70, for rotary operating the power brush 70 and a linear operating device 90 installed in the power brush

70, for moving the power brush 70 in the shaft direction of the supporting shaft 65.

Here, on the lower surface of the head case 61, a suction hole 62 is lengthened-formed (on the drawing) in the horizontal direction to suck fluid and foreign materials from the cleaning object.

The supporting shaft 65 has both end portions fixed on the inner walls of the both sides of the head case 61 and is positioned in parallel to the longitudinal direction of the suction hole 62.

The power brush 70 includes a body part 71 having a cylindrical shape of the center hole and a brush part 73 installed in the spiral shape on the outer circumferential surface of the body part 71. On the both side surfaces of the body part 71, each hole 71A that the supporting shaft 65 penetrates is formed.

The rotary operating device 80 includes a stator 81 combined with the supporting shaft 65 as a single body in the methods such as press fitting and the like and a rotor 85 fixed on the inner circumferential surface of the body part 71 of the power brush 70 to have a certain gap in the outer circumferential direction of the stator 81, being rotary operated by the interaction with the stator 81.

Such rotary operating device 80 has the same or similar structure with the conventional rotary motor.

The linear operating device 90 includes a solenoid coil 91 wound around the supporting shaft 65, for generating flux, a moving core 95 combined with the body part 71 of the power brush 70 as a singly body, for forming a magnetic path where the flux passes around the solenoid coil 91 and springs 96 and 97 supported on the inner walls of the both sides of the head case 61, for supplying an elastic force so that the power brush 70 performs continuouswer brush 70 performs continuousizontal direction when the power brush is linearly operated.

Here, the solenoid coil 91 is wound around the bobbin fixed on the supporting shaft 65 and positioned at the center part of the moving core 95. The moving core 95 has a cylindrical structure being fixed in the power brush and generates a linear driving force due to the difference of magnetic resistance by the magnetic flux generated at the solenoid coil.

The springs 96 and 97 are composed of conventional coil springs and in the embodiment of the present invention, the springs are installed at both sides of the power brush 70. However, at need, the springs can be installed at just one side so that the force opposed to the rectillineal moving force generated by the solenoid coil 91 and moving core 95, namely the force to move the power brush to the original position.

The rotary operating device 80 and linear operating device 90 are installed in parallel to the both side positions of the supporting shaft 65 inside the power brush 70 respectively and generate the driving force to make the power brush 70 to perform rotary and linear movements.

To enable rotary and linear movements of the power brush 70 around the supporting shaft 65 by the rotary operating device 80 and linear operating device 90, a moving supporting means for enabling rotary and linear movements of the power brush 70 is installed between the supporting 65 and the power brush 70.

Figure 5A is a detail view showing "C" portion of Figure 4 and Figure 5B is a cross-sectional view taken along section line D-D of Figure 5A. With reference to Figures 5A and 5B, the moving supporting means is described.

The moving supporting means includes a guide bush 75 formed in a cylindrical shape being fixed around the supporting shaft 65 and a bearing is locked with the guide bush 75 in the rotary direction under the condition that it is

installed in the hole 71A of the power brush 70 being combined with the guide bush 75 by the serration method so that it can perform linear movement relatively.

The guide bush 75 is fixed on the supporting shaft 65 by the spline combining method and guide teeth 75A composed of protrusions and grooves lengthened-formed in the shaft direction so that the bearing 77 is combined on the circumferential surface is formed. At the both end parts of the guide bush 75, a stopper 77B for determining the linear moving area of the power brush 70 by restricting the movement of the bearing not to be seceded.

At the guide bush, the stator 80 of the rotary operating device 80 and a cable hole 75C to supply a power source to the solenoid coil 91 of the linear operating device 90 are formed.

The bearing 77 can be composed of conventionally used ball bearing or roller bearing and in the present embodiment, the ball bearing is applied.

The ball bearing includes an inner race 77A combined with the guide bush 75 and an outer race 77B fixed in the hole 71A of the power brush 70 and a ball 77C installed between the inner race and the outer race. Particularly, on the inner circumferential surface of the inner race 77A, a combining teeth 77A' combined with the guide teeth 75A of the guide bush 75 by the serration method, which is same as the guide teeth 75A of the guide bush 75 is formed.

The operation of the suction head having the power brush in accordance with the present invention with the above structure will be described as follows.

When the fan motor assembly of the cleaner body in Figure 3 is operated, a suction force is generated in the head case 61 and foreign materials such as dusts and the like are sucked together with the air in the vicinity from outside through the suction hole 62.

At this time, when a power is supplied to the stator 81 of the rotary operating device 80, the rotor 85 rotates around the supporting shaft 65 as a single body with the power brush 70 and the brush part 73 of the power brush 70 is rotary abutted to the cleaning object.

Also, when the power is applied to the solenoid coil 91 of the linear operating device 90, flux is generated from the solenoid coil 91, a cable hole 75C where the flux passes the inner portion of the solenoid coil and the moving core 95 and then returns to the solenoid coil 91 is formed.

At this time, the moving core 95 and power brush 70 linearly moves along the supporting shaft 65 to the direction that magnetic resistance is lowered among the passages of the flux and the springs 96 and 97 respectively store up compressive and tensile elastic force.

Later, when the power supplied to the solenoid coil is cut off, the power brush 70 is returned to the initial position by the elastic force of the compressive and tensile springs 96 and 97. When the power supplied to the solenoid coil 91 is continuously turned on and off, the power brush 70 repeats linear reciprocating movement along the supporting shaft 65.

Therefore, the rotary operating device 80 and linear operating device 90 are operated at the same time, the power brush 70 rotates and simultaneously performs reciprocating movement in the horizontal direction. Therefore, foreign materials on the cleaning object can be certainly removed.

Namely, conventionally, the power brush removed foreign materials moving in a rotary direction, that is, just in one direction being abutted to the cleaning object. On the other hand, in accordance with the present invention, the power brush 70 removes the foreign materials moving in a number of directions

such as rotary and horizontal directions and the like being abutted to the cleaning object. Accordingly, the foreign materials on the cleaning object can be efficiently removed and sucked.

Therefore, the present invention can improve cleaning performance of the cleaner by improving foreign material removing function of the power brush 70.

On the other hand, in the present invention, size of the suction head 61 can be reduced comparing with the conventional suction head having an additional operating device outside the power brush by installing the rotary operating device 80 for rotary operating the power brush 70 in the power brush 70.

The suction head having the power brush in accordance with the present invention can improve the cleaning performance by improving foreign material removing function since the power brush performs rotary and linear movements simultaneously and the brush is formed to be rotary and sliding abutted to the surface of the cleaning object.

Also, the suction head having the power brush in accordance with the present invention enables a compact composition by reducing the size of the head case since the rotary and linear operating devices are installed in the power brush.

As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.